



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants: Qinbai FAN
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Group No.: 1753

Serial No.: 10/791,958

Examiner:
Fick, Anthony D.

Filing Date: 03 March 2004

Title: SOLAR CELL ELECTROLYSIS OF WATER
TO MAKE HYDROGEN AND OXYGEN

DECLARATION UNDER 37 CFR 1.132

Commissioner for Patents
Alexandria, VA 22313-1450

Dear Sir:

I, QINBAI FAN, do hereby declare as follows:

- 1) I am a Electrochemist with a B.S. degree in analytical chemistry from Nanjing University in 1984, an M.S. degree in electrochemistry from Shanghai University in 1987, and a Ph.D. in surface chemistry from Cleveland State University in 1995. For the past 10 years, I have been employed and continue to be employed by Gas Technology Institute of Des Plaines, Illinois as an electrochemist conducting research and development in the general area of electrochemical devices. I am an author of 35 publications and an inventor on 8 U.S. patents relating to the area of electrochemistry. I am one of the inventors listed on the above-captioned patent application.

- 2) As one of the inventors, I am well qualified to opine on the subject matter of the above-captioned patent application.
- 3) I have reviewed the Office Action mailed 12 April 2007 in which the Examiner has asserted that the invention claimed in the above-captioned application, which requires a water permeable photovoltaic cell, is inoperable due to shorting of the cell on the basis of the teachings of the prior art cited by the Examiner as to the necessity of protecting photovoltaic cells from contact with water in order to avoid shorting of the cells, and in which, in light of such teachings, the Examiner has asserted that the claimed invention is not enabled by the description in the above-captioned application.
- 4) I have conducted numerous experiments on the invention claimed in the above-captioned patent application which clearly establish that the water permeable photovoltaic cells claimed in the application do not short out and that the invention is operable.
- 5) In one experiment conducted by me, a water permeable photoelectrode was prepared using a photovoltaic panel obtained from Iowa Thin Film Technologies, Inc. (Boone, Iowa) having a front side and a back side. The panel was cut to a size of 1x3 inches and, using a laser, 10 nm holes were

punched in the panel with a distance between holes of about 0.5mm. The back side of the panel was coated with a layer of NAFION® using a 5% NAFION emulsion from DuPont. A copper wire was connected to the p-i-n photovoltaic panel using Ag epoxy. The photoelectrode was inserted into a photoelectrochemical cell with PLEXIGLAS® walls together with electrolyte. A counter electrode of Pt wire was used for electrochemical diagnosis. Two halogen lights were used to simulate sunlight and the voltage of the cell was measured by a voltmeter. The following table shows the results obtained.

Photovoltaic/Photo-electrochemical cell	Single Cell	Expected OCV (V)	Experiment Voltage (V)
Photoanode: Membrane/cc/p-i-n/water (O ₂ evolution)	p-i-n and n-Sc/water in series	1.2	1.433
Photocathode: Membrane/cc/n-i-p/water (H ₂ evolution)	n-i-p and p-Sc/water in series	1.2	1.433
Total Cell Voltage (V)		2.4	2.866

cc - current collector; OCV - open cell voltage

The data show that the water permeable photoelectrode is not shorted by water.

If the photoelectrode had been shorted, there would have been no voltage observed.

I further declare that all statements made herein of my knowledge are true and that all statements made on information and belief are believed to be true; and further that

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these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code.



Qinbai Fan

4/26/2007

Date